

RENEWABLE RESOURCES OF THE UPPER YUKON-PORCUPINE REGION

CHAPTER

Fish and Wildlife

I. Introduction

Fish and wildlife are two extremely important resources of the Yukon-Porcupine region. They not only play a vital role in the culture and economy of the area but also provide recreational opportunities for many persons living outside the region. This chapter presents the most recent information available on the major species and attempts to identify those factors crucial to their well-being. A discussion of the possible social and economic impact of a decline in the fish and wildlife populations is also presented.

II. Fish and Wildlife Resources

The Yukon-Porcupine region possesses a great variety of wildlife habitats: extensive areas of tundra, taiga, upland spruce-hardwood forests and wetlands supporting many diverse species of animals. An estimated 36,000 lakes and ponds averaging 21 acres in area, and over 25,000 miles of streambank provide extremely productive nesting and feeding grounds for many species.¹ In addition to having perhaps the highest sustained rate of waterfowl production in both the U. S. and Canada, the Yukon Flats area also serves as spawning grounds for salmon. Moose, bears, Dall sheep, caribou and wolves are only a few of the many mammals that roam the area.

¹U.S. Dept. of Interior, Rampart Project, Alaska. Volume 1 (Juneau: 1965), p. 302.

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MOOSE

Moose are common to the Upper Yukon-Porcupine region of Alaska. Many lakes and rivers provide excellent habitat in the thick willow stands that line their banks. Forest fires are also common here, creating disturbed areas where willow and birch thrive and add to the moose food supply. Accounts by hunters and trappers indicate that moose existed throughout the area at the turn of the century but little is known about historical changes in moose abundance. During the 1960's and 1970's, however, their numbers have been relatively low.

The reported harvest in the Upper Yukon-Porcupine Region doubled from 1970 to 1974 (Table 1) and further harvest increases are expected to continue as moose scarcity around urban areas induces hunters to travel farther. Boats are the most important means of access, but the use of air taxi services and private aircraft, which was once confined to a few affluent hunters, is becoming increasingly common among both whites and natives. Guided hunters generally confine themselves to the Brooks Range and account for only 10-15 moose a year.² The total subsistence harvest, which is only partially reflected in the reported harvest, is estimated to be between 300 and 500 animals annually. Assuming that each moose provides 500 pounds of utilizable meat, this species provides residents with between 150,000 and 250,000 pounds of food each year.

The bag limit has changed recently from two moose to one bull moose, and the hunting season has been shortened as much as four months in parts

²William Gasaway, Wildlife Biologist for Alaska Dept. of Fish and Game, personal communication, January, 1977.

of the region. Appropriate bag limits are difficult to determine for this area since moose numbers and productivity are essentially unknown, and many unpredictable factors such as weather, predation, and fire cause extreme population fluctuations.

Table 1. Reported Moose Harvest
Game Management Unit 25 (Fort Yukon)

Year	Harvest	Hunters	
		% Non-resident	% Resident
1970	55	20	74
1971	74	26	79
1972	83	39	78
1973	153	20	80
1974	111	19	80

Source: ADF&G, Annual Report of Survey-Inventory Activities, Part II, Moose. Fed. Aid in Wildl. Rest. Project W-17-7 (Juneau:1976)p.183.

Many biologists feel that predation is more important than hunting as a cause of moose mortality. Much research is currently devoted to the controversial subject of the extent of wolf predation on moose, but no absolute solution to the problem is available. It is known, however, that wolves depend heavily on moose throughout the region, except in the Brooks Range where Dall sheep and caribou are available. No predator control program has existed in the area since the 1950's, nor is one anticipated.

Figure 1 indicates the areas within the region which have high potential as moose habitat and it reflects the importance of riparian willow browse. These areas can be crucial during the winter months, when the snow may be too deep at higher elevations for the moose to

browse. Burned areas 5 to 20 years old produce an abundance of willow and birch which moose can thrive on throughout the year. During the warm months, moose browse much more widely, therefore, the vast areas of summer habitat are less critical than winter areas where moose are concentrated.

Developments such as transportation corridors tend to follow the river valleys, and could destroy valuable winter moose habitat. The increased access resulting from development also has tremendous potential for intensifying the hunting pressure. Timber harvesting may have a detrimental effect due to destruction of riparian habitat and increased access, but clear cuts where the litter has been removed or burned will promote the growth of high quality browse. Farming areas would not provide the necessary cover to protect the animals and associated land clearing would destroy the natural food supply. Development would also bring about more fire control to protect commercial forest stands and capital improvements investments and this would prevent the creation of new moose habitat.

To minimize the impact of development on this important species, river bottoms should be left undisturbed. Moose are widely distributed in the summer, and have many alternatives for browse. Thus the effect in these areas will be less significant than disturbance in wintering areas where moose are concentrated and depend heavily on willow. Much of the study region, particularly well-drained spruce forest, is not critical for winter or summer range and development in these areas would have minimal impact on moose populations. Allowing some fires to burn

is still the most effective means of creating and sustaining moose habitat and promoting higher reproductive rates; therefore it should be considered as a means of compensating for some of the effects of development.

DALL SHEEP

Dall sheep occur throughout the Brooks Range as well as in the Tanana Uplands along the southern boundary of the study area. These areas receive moderate snowfall compared with other mountainous regions in Alaska and therefore provide suitable habitat for more than 6,000 Dall sheep. Currently sheep are considered abundant, and their numbers appear to be stable or possibly ^{increasing} declining. No well-documented population fluctuations have been observed in the study area, and it is possible that shepp here do not experience the extreme, cyclic fluctuations common to many other animals.

Sheep home ranges may be about 30 to 40 square miles in size and will sustain a group of sheep indefinitely if not disturbed. Grasses, because they are perenial, provide a stable annual food supply. During the winter, sheep occupy high ridges where prevailing winds expose the vegetation, but in warmer months they utilize valleys and hillsides (see Figure 2). The relatively small size of sheep home range forces it to be considered habitat critical to the survival of local populations.

Sheep are fairly tolerant of man and have been known to exist in close proximity to large scale mining projects, roads, and villages. However, if a project destroys the habitat itself and forces the sheep

to move, they are unlikely to find a range which is not already at carrying capacity and may not survive.

Sport hunting for trophy animals accounts for most of the annual harvest. Table 2 shows an increase of almost 300 percent in the reported sport harvest over the past eight years—an increase possibly due to the rise in Alaska's population and affluence. Historically, subsistence hunting for sheep has been insignificant and this is still true in most areas. The only significant subsistence harvest of sheep in the region occurs in Arctic Village whose residents take less than sixty animals each year. Total annual sport and subsistence harvest in the region is estimated at approximately 110 animals.³

Table 2. Reported Dall Sheep Harvest^(c)

Year	Non-resident	Resident	Total ^(a)
1968	11	5	16
1969	8	5	13
1970	9	4	13
1971	16	13	29
1972	30	15	45
1973	30	25	55
1974	(b)	(b)	48
1975	(b)	(b)	37
1976	15	30	45

(a) Does not include most animals harvested for subsistence purposes.

(b) Information not available.

(c) Source: ADF&G, unpublished reports, 1968-1976.

³Wayne Heimer, Wildlife Biologist for ADF&G, personal communication, January, 1977.

The hunting season on sheep extends from August 10 to September 20, the bag limit being one ram with 3/4 curl horn or larger. Since these older rams are not necessary for continued lamb production, their removal has little effect on the stability of the population. It is estimated that the herd could withstand an annual harvest of about 150 full curl rams or 200 3/4 curl rams.⁴

The guiding services and equipment utilized in the hunting of these animals provide the principal economic value of Dall sheep. Resident hunters may spend a total of \$12,000 annually and non-resident, guided hunters may spend approximately \$15,000 hunting sheep in this region each year⁵ but very little of this enters the regional economy. These animals are also popular as photographic subjects—their beauty and unusual habitat attract many viewers in areas where sheep are accessible.

CARIBOU

The northeast corner of the Upper Yukon-Porcupine region is an important seasonal habitat for the Porcupine caribou herd. This^P herd, Alaska's largest, roams an area of 78,000 square miles from northeast Alaska to northern Yukon Territory and the western edge of the Northwest Territory.⁶ During the summer, the herd occupies areas of wet and alpine tundra where it grazes on grasses, sedges, and shrubs. The winter months

⁴ Ibid.

⁵ Ibid.

⁶ J. Hemming, Distribution and Movement Patterns of Caribou in Alaska, Alaska Dept. of Fish & Game Technical Bulletin No. 1 (Juneau: 1972), p. 13.

are spent in open spruce forests where lichen forage is available under a relatively light snow cover.

From the early accounts of the area, it appears that the herd had a similar distribution in the past, but its population has fluctuated widely. After a low in the 1890's, the herd increased steadily until it reached a peak in the mid-1940's. It declined rapidly in the 1950's but a large emigration from the ^{Forty mile,} ~~40-mile~~ herd may have stopped this trend. The herd is now stable and possibly increasing, largely due to low hunting pressure.⁷

The Porcupine caribou herd was censused in 1972 by an aerial photo-direct count-extrapolation technique⁸ and its population was estimated at 100,000 animals. The sex and age structure for the herd was determined during rut (when animals are assumed to be randomly mixed) to be 48.7 percent cows, 14.8 percent calves, 27.9 percent bulls and 8.6 percent yearlings. The proportion of calves to total herd size fell from 26 percent in July to 15 percent in the fall, but this is apparently normal.⁹

Traveling hundreds of miles each year, the herd is almost constantly in motion. They return to some areas annually, while other prime habitat may not be visited for many years at a time. Although most of the Porcupine herd winters in Canada, some years may find two-thirds of the

⁷James Davis, Wildlife Biologist for ADF&G, personal communication, January, 1977.

⁸Robert LeResche, Porcupine Caribou Herd Studies, ADF&G, Wildlife Restoration Project W-17-5 (Juneau: 1975), p. 1.

⁹Ibid., p. 13.

animals in Alaska from Big Lake to the Coleen River (see Figure 3).

In March the animals begin migrating to the calving grounds on the Arctic coastal plain, which covers the area from the Canning River in Alaska to the Blow River in Canada. Most of the caribou spend the summer in the foothills of the eastern Brooks Range and in the British and Richardson Mountains of Canada. Each fall the herd swings south again toward the wintering grounds which are usually reached by late October.

The most critical range in the Yukon-Porcupine region is the winter range where up to 70,000 caribou graze in some years (see Figure 3). This is an area of low density spruce with willow and birch shrubs and a ground cover of moss, mountain dryas, and lichens. Caribou avoid deep snow and can be severely affected if a thick ice crust forms. The sparse forest cover thus provides critical winter habitat by protecting lichens from deep snow cover and by providing suitable habitat for their growth.

Hunting and predation are the major factors currently regulating the size of the herd. An estimated 1000-2000 caribou are harvested each year in the United States; possibly 5-10 percent by sport hunters, and the rest for subsistence.¹⁰ The subsistence harvest in Canada is approximately 2,500 animals.¹¹ The total annual harvest thus amounts to approximately 4,000 animals or roughly 6 percent of the population, which

¹⁰ADF&G, Compilation of Fish and Wildlife Resource Information for the State of Alaska. Volume I: Wildlife. (Anchorage: 1976), p. 503.

¹¹LeResche, Porcupine Caribou, p. 3.

is slightly higher than an estimated sustained yield of under 5 per-cent.¹² Another detailed census of the herd is scheduled for the summer of 1977, and this will supply information on the annual increment and approximate mortality rate—information vital to proper management of the herd. Hunting regulations for the Porcupine herd were altered in September 1976 in response to the worsening situation of the Western Arctic herd. The hunting season, which was open year around has been restricted to August 1 - March 31 in Unit 26 and July 1 to March 31 in Unit 26C. The bag limit which was formerly unlimited is now restricted to ten caribou per season with no more than five per day and no more than two can be transported from these units.

The winter food supply in the area can be affected by overgrazing, weather and fire. Overgrazing may be a factor in caribou mortality when the population density exceeds ten or so per square mile.¹³ There is evidence, however, that caribou shift their range as their density increases; such patterns are often found with the Porcupine herd.¹⁴ The concept of rangeland carrying capacity therefore has limited use for caribou, but as a generalization, approximately one caribou per square mile of grazing land may be a safe long-term carrying capacity.¹⁵

¹²James Curatolo, Wildlife biologist for Renewable Resources, Ltd., personal communication, January, 1977.

¹³J. P. Kelsall, The Migratory Barren Ground Caribou of Canada (Ottawa, Canada: Queen's Printer, 1968), p. 310.

¹⁴Hemming, Distribution, pp. 14-17.

¹⁵James Davis, personal communication, January, 1977.

Because of their dependence on tree-covered areas for much of their winter habitat, caribou can be severely affected for forest fires. The greatest lichen production is in areas unburned for 120 years or more,¹⁶ and vast areas of such vegetation are sometimes destroyed by one fire and require more than 70 years to recover. Caribou also tend to avoid recently burned areas during migrations and this could cause a critical delay in their travel.

There is no evidence of excessive predation on the Porcupine herd at present. Wolves are the major caribou predator in the region, but grizzly bears also take a few, and golden eagles may sometimes prey on young calves. In the past, wolf numbers demonstrated an apparent increase during caribou decreases, and a corresponding decrease when caribou were improving, but it is possible that wolf predation merely accentuated the normal fluctuations.¹⁷

Very few management activities can be applied to increase the size of a caribou herd. If overhunting or predation are responsible for significant losses, stringent hunting regulations or predator control can be utilized to protect and increase the herd. Increasing the herd through habitat manipulation—which is useful for many game species that depend on successional stages of vegetation—is not feasible for caribou, which depend primarily on climax vegetation. Here, any changes will probably be detrimental and the vegetation will require many years to recover.

¹⁶Art LaPerriere, Feasibility of Caribou Winter Habitat Analysis Using Satellite Data, 1976(Fairbanks: University of Alaska), p. 3.

¹⁷R. Skoog, Ecology of the Caribou in Alaska, 1968 (Berkeley: University of California), p. 410.

The maintenance of undisturbed winter habitat is therefore important when evaluating potential effects of development.

Developments now being considered which might affect the Porcupine herd include the Arctic Gas Pipeline to the Mackenzie Valley and the Dempster Highway from Inuvik to Dawson. The status of the pipeline is undetermined as yet, but approximately 200 miles of the Dempster Highway is already complete. It is likely that this access will severely increase the hunting pressure by both whites and natives and interfere with migrations.

It is difficult to identify specific areas which should be protected, since caribou range can vary—an unused area becoming crucial at a later date. Within the study area, caribou use almost all of the Brooks Range and cross the Porcupine River semiannually. Biologists suggest that roads, pipelines, etc., should always parallel caribou trails and that crossing features be provided if these structures intersect traditional routes. Areas where a broad front of animals is funnelled into a narrow trail, as at mountain passes and river crossings, should be protected from any development program. Construction activities should also be timed so as to minimize interactions with the herd as they are feeding or passing through an area.^{18,19}

The economic value of caribou as a renewable resource in this region of Alaska should not be overlooked. Most domestic animals and

¹⁸LeResche, Porcupine Caribou, pp. 18-19.

¹⁹James Curatolo, personal communication, January, 1977.

plants are not suited to the Arctic habitat of the caribou, and timber resources in northern alpine areas are of poor quality and require many years to regrow. Therefore, the most efficient use of the tundra and open taiga forests of this area may be for caribou range. They are a traditionally utilized resource and provide an important means to preserve the native lifestyle. A well-managed herd will supply significant amounts of food: a harvest of 1000-2000 caribou at 70 pounds of dressed meat each would yield at least 7,000 to 14,000 pounds of red meat. The hides, and the crafts made from them, are also of value. Recreation and sport hunting are increasing in Alaska, and the money that hunters spend on equipment, guiding services, travel and accommodations can be considered another economic benefit. Nonconsumptive uses, such as viewing by researchers and visitors, have a value which is difficult to assess. Careful management and protection of the herd and its habitat is vital if the Porcupine herd is to continue to play an important role in the economy of the region and serve as a source of inspiration and enjoyment for generations to come.

BLACK BEAR

The black bear population in the region may be as large as 2,400 animals.²⁰ They range through many habitats, but lowland areas of sedges and horsetails and berry-producing areas are the most important. The river valleys are also vital since bears use the alluvial habitat as access to new feeding areas. The harvest does not seem to be a significant

²⁰ADF&G, Compilation of Wildlife, p. 420.

factor in their mortality because the population is apparently not declining at the present time. Black bears are actively hunted by local residents; an estimated 120 are killed each year for meat. Assuming that each bear yields 150 pounds of utilizable meat, the annual harvest would produce 18,000 pounds of food. Sport hunting for black bear is negligible.

BROWN OR GRIZZLY BEAR

Brown bear depend on extensive undeveloped, sparsely inhabited areas. Although their dens are found principally on well drained, south-facing slopes, they also require alluvial habitat for movement between widely dispersed feeding areas. During the spring, they consume carrion and live prey they can obtain; in summer they are widely dispersed and autumn finds them concentrated in willow stands and berry patches.

The population in this region is estimated to be 450-900 bears, and it is stable despite a large harvest.²¹ Resident sport hunters take an average of eleven bears; non resident hunters, principally on guided hunts, take approximately 100 bears annually. Natives rarely hunt grizzlies; they may kill a total of forty bears each year—most of which are nuisance animals not utilized for meat. The value of the sport harvest can be estimated on the basis of an average ten-day guided hunt, costing \$2,000 to \$3,000 and obtaining two bears. This amounts to approximately \$125,000, most of which is spent outside the region and therefore, does not enter the local economy. The nonconsumptive uses, such as viewing

²¹Ibid., p. 423.

and photographing, are becoming increasingly popular, particularly in the Arctic National Wildlife Range.

FURBEARERS

Wolves, beaver, land otters, wolverine, marten, lynx, red fox, and mink are the major furbearers in the Upper Yukon-Porcupine Region. Trapping these animals is an important source of income for the people of the area and biologists believe that the furbearers are currently fairly abundant and that an expanded harvest could be sustained without endangering the populations. Some subsistence use occurs, but relatively few animals are taken for noncommercial purposes. Watching and photographing these mammals is a prized passtime for many hikers.

Wolves are one of the most important furbearers for trappers due to the current high price of \$100 to \$300 per pelt.²² An estimated 600 wolves roam the Upper Yukon-Porcupine Region.²³ Their dens are usually located on well-drained south-facing slopes and these are the only specific areas that are critical for wolf survival. Because of their dependence on prey species, however, wolves will be endangered if prey populations are severely diminished.

Caribou and moose are the important prey species. This is demonstrated by the fluctuations in wolf numbers which correspond, with a slight lag, to those of caribou and moose. It is not known however

²²The source of all information on furbearer harvests and prices is: ADF&G, Compilation of Wildlife, pp. 514-676.

²³Ibid., p. 630.

whether wolves cause or merely accentuate these fluctuations. Alternative prey, such as snowshoe hare, Dall sheep, and fish, supplement the diet and protect the wolves from starvation when major prey decrease in numbers.

Trapping and some illegal aerial hunting are the most significant factors in wolf mortality. It seems, however, that the harvest pressure results in an increased reproductive rate and greater pup survival.²⁴ Whatever the reason, wolves in this region seem capable of sustaining an extremely high annual harvest of 50 percent of the population.²⁵ Therefore a large expansion in the harvest is conceivable, since only 48 wolves or roughly 8 percent of the population were harvested in 1975, and the value of pelts is expected to continue to increase. The hunting season on wolves extends from August 10 to April 30; the bag limit is two wolves, but there is no limit on trapping.

Wolverine, marten, and ermine are three important furbearers in the weasel subfamily. Wolverines are usually found above timberline in the region. Carrion is their principal food source, but live squirrels and hares, as well as occasional large game such as sheep, are also taken. They are generally considered a "wilderness" animal, i.e., one that cannot adapt to the presence of man, but it is possible that they would not be affected by man's use of the land if their habitat were not destroyed and if protection against overharvesting was available. Presently, a moderate harvest of 130 animals is taken in the region, but because of the current high value of over \$150 per pelt, the trapping pressure may increase.

²⁴Ibid., p. 623.

²⁵Ibid., p. 626.

Marten are fairly easy to trap and are probably ^bundant in the region. Their diet includes microtines and some berries and good habitat will support up to four animals per square mile. Climax white spruce areas are critical for marten; therefore, logging and forest fire are a serious threat to their populations. The current price of \$40 to \$50 a pelt is high and may stimulate an increase in trapping. No harvest information is available from the region.

Ermine rely on woody or brushy areas and feed on small mammals and birds. They are also an important prey for raptors and larger mammals. The pelts sell for only \$1.00 each, making ermine a minor source of income. No harvest information is available.

Land otters and muskrats take advantage of the abundance of prime aquatic furbearer habitat in the region, particularly in the Yukon Flats. Land otters are valuable for trapping, their pelts bringing up to \$80, while muskrats bring \$5.00. Overtrapping of these animals does not seem to be a problem and their populations are probably stable. Destruction of their denning areas due to development near waterbodies would be a severe menace to their survival.

The Yukon Flats is also prime habitat for mink, which inhabit vacated dens near the water. Their fur is valuable, selling for \$20 to \$20 a pelt, but trapping does not seem to be significant at the present time. Critical denning areas could be destroyed by track vehicles, logging, forest fires or other factors which disturb vegetation along the banks.

Red fox and lynx are both valuable furbearers which depend heavily on snowshoe hares for food. Three hundred fox were harvested in 1973-74 at a market value of \$60 to \$165 each. They are not presently overtrapped according to Fish and Game officials and probably could sustain a larger harvest.

The lynx, Alaska's only cat, occupies climax boreal forests with many thickets where hares can be readily found during good years. Because snowshoe hares fluctuate drastically in numbers, lynx are also subject to cyclic extremes in their populations—the cycle lasting approximately ten years. Over 660 lynx were harvested in 1971-72, principally around Fort Yukon; their value is currently \$200 to \$300 each. Red fox and lynx can often be seen during highs in the hare population.

Beaver is an important furbearer and one of the most popular animals for viewing and photographing. Their population declined critically at the turn of the century from over harvesting, but controls on harvests have gradually helped to bring them back to stable numbers. Most beaver colonies are found near birch and aspen stands; one acre of aspen will support a colony of beavers up to three years. Their dams are carefully built and maintained and not only stabilize watersheds by retaining water, but also create a lush wetland habitat which many species of wildlife can utilize. Although the greatest number of beaver in the region are in the prime habitat of the Yukon Flats, they have also been seen above timberline on the upper Sheenjek River. They are a valuable furbearer—their pelts bring \$30 to \$40 each, but no significant harvest

has been taken recently. The harvest in 1973-1974 was 317 and in 1974-1975 it was 281 animals. If not harassed, beaver adapts well to the presence of man, as demonstrated by colonies in and close to Fairbanks.

The Upper Yukon is excellent habitat for coyotes, but few are seen in the area. These animals are generally very adaptive and show little conflict with human land-use, but competition with other predators in the region might be limiting their numbers at the present time. Coyote trapping usually occurs incidentally to that of other animals and, though the price is approximately \$60 per pelt, most of the hides are kept for domestic use. The wary nature of these animals make them difficult to view.

WATERFOWL

The Yukon Flats, an area of approximately 10,800 square miles, is one of the most productive single-habitat waterfowl nesting grounds in the world. Aquatic habitat in the area is abundant; thousands of lakes and ponds with a total estimated surface area of over 1,200 square miles and more than 48,000 miles of lakeshore and streambank habitat provide food and cover for more than one million nesting waterfowl.²⁶ A high rate of primary productivity is caused in part by hot summers, frequent forest fires and periodic flooding. The greatest importance of the Flats to migratory birds is for nesting and rearing of young, although several

²⁶United States Dept. of Interior, Rampart Canyon and Reservoir Project, Yukon River - A Report on Fish and Wildlife Resources, Vol. 1, (Juneau, 1965), p. 274.

species which summer on the North Slope and northwest Canada use the Flats as a stopover during migrations. The density of ducks alone averages 9.4 birds per square mile (see Figure 4) and unlike other densely-populated nesting areas, the Yukon Flats is not subject to drought and therefore has the highest sustained rate of production in North America.²⁷

Over one million ducks nest on the Flats (see Table 3). Scaup are the most abundant, followed by pintail, wigeon, green-winged teal, scoter, and mallard. Ten to fifteen percent of the total continental population of the highly valued canvasback ducks nest in this area—a very significant population, given the declining status of this species in the eastern United States.

Observations indicate that over 8,000 Canada and 5,000 white-fronted geese utilize the lakes and streams of the area. Their fall populations are probably greater than 10,000 and 6,500 respectively. A few families of the rare trumpeter swan have also been sighted.

Cranes, loons, grebes and shorebirds are common during the nesting season. About 10,000 sandhill cranes breed here each year and produce an estimated 1,500 young. The breeding population of arctic loons may be 15,000; while common and red-throated loons are also found. The populations of horned and red-necked grebes, which are distributed on shallow lakes throughout the region, is estimated at over 100,000.²⁸

The harvest pressure within the region is largely incidental to big game hunting, but considerable numbers are taken for subsistence,

²⁷ADF&G, Compilation of Wildlife, p. 724.

²⁸USDI, Yukon Flats National Wildlife Refuge(Washington, D.C.: 1974), p. 79.

particularly when other food resources are scarce. A study conducted by the U. S. Fish and Wildlife Service indicates that approximately 11,000 ducks and 3,000 geese are harvested annually by local residents and these estimates are probably conservative.²⁹ The fall sport harvest in the region may average 500 ducks and 100 geese.³⁰

Assuming that ducks weigh an average of 1.25 pounds and geese 3.5 pounds, waterfowl provide 24,200 pounds of meat for the residents of the region. Alaskan sport hunters are estimated to spend an average of \$37 per day to hunt waterfowl in the Interior. Assuming an average of 1.1 ducks harvested per hunter per day, a total of \$20,350 is spent to harvest 600 waterfowl in this region each year, although this does account for the value of other game which might be taken on the same trip.

The harvest outside Alaska is much greater. The U. S. Fish and Wildlife Service estimated that 20 percent of the 2.1 million ducks in the fall flight from the Yukon Flats are harvested outside the state and that this harvest provides 400,000 hunter days.³¹ An average waterfowl hunter devotes 5.5 days to hunting each season and spends approximately \$110 on supplies, making a total of over \$8 million as a rough estimate of the recreational value of the sport harvest.³² The value of watching, studying, and photographing these birds is difficult to assess, but just as important. The fact that well over 2 million birds originate here

²⁹Ibid., p. 97.

³⁰Dan Timm, Wildlife Biologist for ADF&G, personal communication, February, 1977.

³¹USDI, Yukon Flats, p. 60.

³²Morris LeFever, Waterfowl biologist for Fish and Wildlife Service, personal communication, December, 1975.

each fall is a source of invaluable inspiration for many, as demonstrated by the public's strong opposition when Rampart Dam was being planned in the mid-1960's.

The riverbottom habitat in the Yukon Flats corresponds to the location of much commercial timber, potential oil fields and farmlands (see Chapters). Any river traffic associated with timber removal would disturb the waterfowl which use sandbars and sloughs for nesting or feeding and timber harvesting could destroy cover vital to some nesting species. Water pollution due to siltation, pesticides, logging debris, or oil spills could also be a threat to wetland productivity. Drainage of wetlands or construction of dams, if necessary for large scale farms, would represent a serious menace to the breeding populations and undoubtedly reduce the production many-fold. The roads, processing plants, and settlements associated with any development would also impair many critical areas.³³

UPLAND GAME BIRDS

Game birds to the region include the rock and willow ptarmigan, and the ruffed, spruce, and sharp-tailed grouse. These birds are widely distributed and are important prey for avian and mammalian predators. They are hunted for both subsistence and recreation, but their harvest is usually incidental to that of larger game.

³³Dan Timm, personal communication, February, 1977.

Table 3. Waterfowl Populations of the Yukon Flats

Species	Nesting Population	
	Number	Percent
Ducks		
Mallard	63,700	6.0
Gadwall	300	trace
Pintail	188,300	16.6
Green-winged teal	30,500	7.5
Blue-winged teal	trace	trace
Wigeon	140,800	14.0
Shoveler	53,300	5.0
Ring-necked duck	trace	trace
Canvasback	50,500	4.7
Lesser scaup	376,700	35.1
Goldeneye	12,100	1.1
Bufflehead	17,600	1.6
Oldsquaw	26,100	2.4
Scoter	63,700	6.0
Mergeanser	100	trace
Total Breeding Population	1,073,700	100
Estimated Fall Population (Adults plus young)	2,147,000	
Geese		
Canada	8,000	61.5
White-fronted	5,000	38.5
Total Breeding Population	13,000	100
Estimated Fall Population (Adults plus young)	16,500	

Source: United States Dept. of Interior. Yukon Flats National Wildlife Refuge (Washington, D. C.: 1974), p. 66.

Rock and willow ptarmigan live in all treeless areas in the region; rock ptarmigan prefer the higher rocky areas; willow ptarmigan are found in the dense patches of vegetation at lower elevations. The life history of the two species is very similar. Large flocks form in autumn and migrate up to 150 miles in search of sheltered areas at or slightly below timber line where they will remain for the winter. In April, the birds collect again for the move to the breeding grounds and then disperse for the summer months. The population of ptarmigan fluctuates between scarcity and abundance in cycles of approximately ten years. Because ptarmigan occupy the climax tundra there is little to be done to improve their habitat.

Spruce grouse are found in spruce and spruce-birch forests with understories of cranberries, blueberries, and mosses. In September they can be seen near roads and rivers where they obtain grit for digesting the spruce needles that sustain them in winter. Fire control benefits this species, which depends on mature coniferous forests.

Sharp-tailed grouse occupy brushy grasslands often at high elevations. They are not numerous and for this reason few are taken for subsistence or recreation. In the fall, these birds form flocks which feed on berries and insects and on barley in farming areas. Sharp-tailed grouse populations might be benefitted by disturbances such as fire and construction which favor their successional habits.

Ruffed grouse are found in riverbar situations in the willow thickets and aspen stands. Identified by the black band near the tail and dark ruffs on each side of their neck, these birds are easily found and hunted along roads in the fall. Disturbed areas would benefit this species.

For unknown reasons, extreme population fluctuations are common to all game birds in the region. Currently, the subsistence and sport hunting that exists is a minor factor in their mortality.³⁴ The hunting pressure is expected to increase, however, as seasons shorten for large game. The bag limit is now 15 grouse and 20 ptarmigan; the season extends from August 10 to April 30 and this may need to be shortened to protect the ptarmigan breeding grounds if harvest pressure increases.

RAPTORS

Raptors are birds of prey that perform an important role by limiting the populations of small birds, rodents, and insects, and by feeding on carrion. They include the hawks, eagles, falcons, and owls whose skill in flight and in the pursuit of prey has fascinated people for centuries.

Nineteen species of raptors utilize the Upper Yukon-Porcupine Region of Alaska, and are listed in Table 1. Although their populations vary with prey abundance, most of the raptors are not in any foreseeable danger in this region.³⁵ Disturbances near rivers, however, could affect many traditional nesting sites.

Gyrfalcons and roughlegged hawks are uncommon to common and are scattered throughout the drainages of the southslopes of the Brooks Range. Golden eagles are probably a little more adaptable and are also found along interior wooded regions especially if alpine areas are close at hand. Woodland species understandably increase as one travels south

³⁴Jerry D. McGowan, Avian biologist for ADF&G, personal communication, January, 1977.

³⁵Ibid.

and many, such as the greathorned, great grey, and hawk owls, find their northern limits in the region. The two fish-eating species, bald eagles and ospreys, are probably rare or occasional nestors restricted by ice conditions as well as by the turbidity of the Yukon River and its tributaries.³⁶

One endangered species, the peregrine falcon, utilizes the region during the nesting season (Figure 4). It nests in the cliffs above the Yukon and Porcupine Rivers and pursues waterfowl and small birds. Their population declined 60 percent worldwide after DDT was introduced on a large scale,³⁷ and now that DDT is banned in the U. S., the protection of nesting sites has become a critical factor in assuring the survival of this species. Two other nesting populations of peregrines in Alaska, one on the Colville River and one on the Tanana, have declined rapidly in the past five years and the Tanana population has now virtually disappeared.³⁸ The areas between Eagle and Circle on the Yukon River and above Fort Yukon on the Porcupine support dense populations which still appear to have normal reproductive rates. These areas, however, are vulnerable to development and tourism. According to the Endangered Species Act of 1968, a cliff must not be disturbed for a quarter of a mile around a nest and a permit is required to construct near the area. Due to the sparse tree cover in this region, however, a

³⁶Robert Ritchie, Wildlife Biologist for Renewable Resources, Ltd., personal communication, January, 1977.

³⁷Jerry McGowan, personal communication, January, 1977.

³⁸Alan Springer, "Dismal Picture for Alaska's Peregrines," in Alaska Conservation Review, Vol. XVII, No. 3, p. 5.

Table 4. Raptor Populations in the Yukon - Porcupine Region

Classification	Species	Abundance	Migratory (M) Resident (R)
Owls	great grey owl	Uncommon	R
	horned owl	Common - Abundant	R
	hawk owl	Common	R
	snowy owl	Rare	R
	boreal owl	Common?	R
	short-eared owl	Common?	M
Hawks	Harlan's hawk	Common	M
	Swainson's hawk	Uncommon	M
	Roughlegged hawk	Uncommon?	M
	Golden eagle	Common	M
	Bald eagle	Uncommon	M
	Sharpshinned hawk	Common	M
	Goshawk	Common	R
	Marsh hawk	Common	M
Falcons	Osprey	Uncommon	M
	Merlin	Common	M
	nestrel	Common	M
	gyrfalcon	Uncommon*	R
	peregrine	Uncommon*	M

*Locally dense

Source: Robert Ritchie, personal communication, January, 1977.

large buffer zone may be warranted.³⁹ The Department of Fish and Game keeps a record on nesting areas and insures their protection.

ANADROMOUS FISH

Anadromous fish are those which spawn in fresh water but spend most of their lives in the ocean. Chum, king, and coho belong to this group and are found in the Upper Yukon-Porcupine Region during the spawning season and throughout the year in early stages of their development. Although their numbers vary widely, approximately 270,000 salmon migrate upriver past Rampart between late June and October each year.⁴⁰ These fish support a valuable subsistence and commercial harvest in the region.

King salmon, with an average weight of over 15 pounds, are the largest of the Pacific salmon. After hatching, the young usually remain in fresh water until their second spring before migrating out to sea where they will spend up to four years. King salmon have been reported in Beaver Creek, Birch Creek, and the Chandalar River from late June until late August. The population has declined significantly in the last few years, but the cause of this has not been determined.

Thousands of chum salmon migrate upriver past Rampart between early July and October each year. The smolt migrate to the ocean during their first spring and spend two to four years at sea before returning. Their spawning grounds include the Sheenjek, Chandalar and Black Rivers,

³⁹Robert Ritchie, personal communication, January, 1977.

⁴⁰USD1, Yukon Flats, p. 89.

Squaw Creek, Beaver Creek, and possibly the Collien River. The declining population of kings may be contributing to the increasing importance of chum salmon as a commercial fish.

Little is known about the occurrence of coho or silver salmon in the region. Recently several land-locked lakes in other parts of Alaska have been stocked with coho and are producing excellent sport fisheries; a similar effort in the Upper Yukon-Porcupine Region could provide many salmon for the area. Under these conditions, however, coho do not reproduce and therefore would have to be restocked annually.

At the present time, there is little commercial fishing above Rampart. An average of twenty fishermen have had commercial licenses in the region in the past five years. As of January 1974, however, fishermen were required to apply for limited entry permits, which were granted on a point system designed to favor those who depended heavily on commercial fishing during the years 1971-1974. The number of fishermen possessing limited entry permits is not yet available, however. Sport fishing for salmon is negligible. Although the opening of the pipeline haul road to the Yukon River in 1972 increased sport fishing in the immediate area, very little occurs elsewhere in the region.

Subsistence fishing for salmon declined from 1930 to 1970 as a result of both regular shipments of food from outside and the decline of dog teams with the advent of the snow machine. An increase in the subsistence harvest after 1970 was probably a response to unusually large salmon migrations during those years, but the catch decreased sharply in 1976 when the salmon run declined. The total amount of fish

Table 5. Reported Commercial Salmon Harvest Upper Yukon-Porcupine Region

Year	No. of Licensed Fishermen	Chum	King	Coho	Total Salmon
1970	(a)	907	1,666	(a)	2,573
1971	10	1,061	1,749	38	2,848
1972	7	1,254	1,092	22	2,368
1973	23	1,309	13,003	(a)	14,312
1974	17	28,013	2,661	1,500	32,174
1975	20	40,344	2,865	5	43,214

(a) No information available.

Source: ADF&G, Arctic-Yukon-Kuskokwim Regional Fisheries Reports, unpublished data, 1970-1975.

Table 6. Reported Salmon Subsistence Harvest Yukon-Porcupine Region

Year	Rampart	Stevens	Beaver	Ft. Yukon	Circle	Total
1970	5,402	9,143	3,151	7,373	(a)	25,069
1971	11,361	5,224	2,316	3,854	(a)	22,756
1972	4,930	2,120	3,298	2,117	1,097	13,562
1973	5,216	4,183	1,483	3,268	897	15,047
1974	1,619	2,428	1,078	955	1,672	7,752
1975	10,226	2,391	719	20,205	865	34,406
1976	4,246	1,387	393	1,634	409	8,069

(a) Data not available.

Source: ADF&G, Arctic-Yukon-Kuskokwim Regional Commercial Fisheries Reports, unpublished data, 1970-1976.

consumed by subsistence users can be computed on the basis of 15 pounds for king salmon and 4.3 pounds for other salmon. Based on this, a minimum of 8,000 pounds of fish would be required to replace the average subsistence salmon harvest.

Fish hatcheries could possibly benefit the salmon populations in the region, provided several economic and environmental requirements could be met. In order to minimize costs, a hatchery should be built near a road where supplies could be readily obtained. Another major expense is labor which could be minimized in private hatcheries, such as village-owned and village-operated ones, where cooperative management would be feasible. A small hatchery could incubate at least 100,000 eggs with as many as 90 percent of them surviving to hatch, but only 0.1 per 3.0 percent of these, or approximately 1,000 fish, would be expected to return to spawn. This would be a significant contribution in years such as 1976, when the total harvest was less than 10,000 fish.

Environmental requirements of hatcheries include unpolluted and extremely reliable water supplies. Especially good sources would be artesian wells and high gradient streams where no electricity is required to keep the water moving through the incubation tanks. It is also of critical importance to select a stream where there are no native salmon or where they are declining. This is required by state law in order to protect the native salmon run from competition by hatchery fish.

A simple chum salmon hatchery might be built for \$5,000 to \$10,000 if incubation boxes and an artesian well or high gradient streams are utilized. A king and coho hatchery, on the other hand, could require an initial investment of \$1 million and, because these salmon remain in the

hatchery much longer than chum, they must be fed and attended regularly. Utilization of hot springs, provided the water quality is suitable, would decrease the time spent in fresh water by almost half, but the expense of food would still be a major drawback of king and coho hatcheries.⁴¹

Any areas where salmon spawn are critical and will tolerate few alterations. If logging roads, pipelines, or similar developments are to occur in the region, construction activity should be minimized during migration and spawning periods (July 1 to October 30). The eggs, which are present from July until March, are especially susceptible to death by suffocation due to siltation. The fry are most vulnerable to oil contamination during the period from March until May. Such disturbances would not only kill vast numbers of both anadromous and resident fish, but would endanger the livelihood of many fishermen.⁴²

RESIDENT FISH⁴³

Several species of fish, including northern pike, arctic grayling, whitefish, burbot and sheefish, remain in the Yukon-Porcupine region throughout their life cycle. Although the turbidity of the Yukon River limits its productivity, the lush vegetation and warm temperatures in the many tributaries of the Yukon and in thousands of lakes and marshes supply an abundance of habitat for fish.

⁴¹Jim Raymond, Hatcheries Biologist for ADF&G, personal communication, February, 1977.

⁴²Fred Andersen, Salmon Biologist for ADF&G, personal communication, February, 1977.

⁴³All harvest statistics were obtained from: USDI, Yukon Flats, p. 97.

Twenty pound pike are fairly common in the clear water tributaries and sloughs of the Yukon, and they are rapidly becoming one of the most important game fish in the Interior. Local use of pike may total 16,000 per year. Subsistence fishing for sheefish is a traditional use, accounting for approximately 7,000 fish annually, but sport fishing is becoming increasingly popular. Arctic grayling also make excellent sport fishing and are important subsistence fish in Arctic Village and Venetie. The Fish and Wildlife Service estimate that 22,000 grayling are caught each year for subsistence use. The burbot is found throughout the region in cool, deep waters. Mature burbots range from twelve to eighteen inches in length and less than 100 are taken, most of them during the winter months. White fish inhabit most of the tributaries and lakes in the region, and are of considerable importance as a subsistence resource; the catch may total over 53,000 fish per year. These species depend on the clear, cold lakes and streams of the region, and are extremely vulnerable to thermal or chemical pollution.

Although whitefish and pike are used extensively in the villages, subsistence use of other fish is dependent upon the supply of large game and salmon, which are preferred. Sport fishing is expected to increase due to improved access along the haul road, a larger human population both within and outside the region, and the increasing interest in outdoor recreation. It has been estimated that 20,000 visitor days for sport fishing could be supported in the region each year.⁴⁴

⁴⁴USDI, Rampart Project, p. 250.

III. Wildlife Scenarios

In an effort to summarize the social and economic value of the wildlife, it will be assumed that one of two hypothetical situations could occur. In the first, wildlife populations would remain stable and, under careful management, continue to supply large quantities of meat and hides as well as recreational opportunities. In the second, it will be assumed that development activities adversely affect wildlife and reduce the supply of subsistence and recreational commodities.

IMPLICATIONS OF STABLE WILDLIFE POPULATIONS

Table 6 attempts to quantify the economic value of the wildlife in the region; it gives the estimated subsistence harvest and calculates the monetary value of the meat in terms of the cost (at 1977 prices) of an equivalent amount of imported beef or fish. If, through both careful management and very limited development, the wildlife and the annual harvest remain stable, this table can be indicative of the annual economic value these resources will continue to provide.

Several qualifications must be kept in mind when using replacement values. First of all, they are based on estimates of the subsistence harvest over which there is much disagreement. Second, because the nutritional content of wild game is higher than that of beef, the value of beef (in terms of cost per gram of protein) is actually much less. Third, many of the hides are virtually irreplaceable; they have a multitude of uses which makes it difficult to establish their replacement value. Fourth, it is obvious that such a table cannot evaluate the importance of the subsistence lifestyle which forms the foundation of the

culture in the region. Other factors indicate that these figures may overestimate the value of the harvest: they do not account for the significant portion of meat used as dogfood (which could be replaced for relatively little cost) nor do they attempt to balance the expense of hunting equipment, such as snowmachines, with the return in meat and hides. Nevertheless, substitution costs can help us to appreciate the concern about subsistence resources. If the wildlife is well managed, it will continue to be of value indefinitely—something which ^{should} ~~would~~ be a factor in any comparison with either nonrenewable resource development or utilization of renewable resources which have much slower regeneration rates than those of wildlife.

Social and cultural benefits of wildlife, however, cannot be quantified as easily. Subsistence is an integral part of the lifestyle of almost all ~~h~~atives and also of many Whites of the region. Even those ~~h~~atives who have a cash income via seasonal jobs outside the area, continue to participate in hunting and gathering activities. Sharing wild game is a fundamental aspect of village life; it occurs widely both within and between villages (store-bought food is considered less desirable; it is not shared and therefore, does not provide the same social bond). Wild game also serves a ceremonial purpose during potlatches on holidays, funerals, or special occasions. Partnerships for trapping and hunting result in social and economic ties within and between villages. The traditional lifestyle also provides an invaluable sense of identity and continuity in a time of rapid change.

Nonconsumptive uses of wildlife are increasing. Creation of the Arctic National Wildlife Range in 1960 has probably expanded the recreational use of this area. Hikers, photographers, and wildlife researchers may in time contribute to a small tourist and lodging industry in the region. Interest in protecting wildlife for their inherent worth is also a concern shared by many; national conservation organizations consider Alaska's wilderness area and wildlife invaluable at a time of widespread industrialization.

Thus, if the wildlife are maintained at stable levels, they will continue to play a significant role in the economy, recreation and traditional way of life in the region.

IMPLICATIONS OF DECLINING WILDLIFE POPULATIONS

Table 8 attempts to portray the direct impact which various development activities would have on selected wildlife populations. The intent is to demonstrate, in strictly relative terms, each activity's beneficial or adverse effect on the wildlife resources. The values indicated in the table were provided by wildlife biologists who were asked to rate, on a scale from +5 (most beneficial) to -5 (most adverse), the hypothesized direct impact of an activity. Although the values are strictly estimates, the table can be useful in indicating which species of wildlife are the most sensitive to a given development activity, or conversely, which activity is the most disruptive to wildlife. For example, peregrine falcons and caribou would likely be more sensitive to development than snowshoe hares or coyotes. River dams would have the most deleterious

effect while pipelines would have fewer direct impacts. Some activities, such as fire control, may benefit one species but endanger another. The table does not, and cannot, indicate the multitude of "ripple effect"—or indirect impacts—which a large scale activity could have. However, these impacts usually involve urbanization, additional habitat destruction, and increased hunting pressure which are often much more disruptive than the direct effects.

If large scale development occurred in the region and the wildlife confronted the hazards mentioned earlier, their populations would decline significantly. The possible economic loss can be estimated by examining Table 7. For instance, if the caribou harvest declined 70 percent due to increased habitat alteration or hunting pressure associated with new roads, approximately \$210,000 worth of imported meat would be required annually to replace the normal supply. Due to this decrease in caribou populations, sport hunting would be prohibited and result in an economic loss both within and outside the region.

The cultural and aesthetic loss is more difficult to assess but would probably be even greater than the economic loss. The many ways in which the Native culture depends upon wildlife, as discussed in the first scenario, indicate that removing the subsistence resources will also remove the foundation on which the Native culture and economy is built. The interest in protecting wildlife for their intrinsic value and for their many recreational benefits was also discussed in the first scenario. It is virtually impossible, however, to estimate the extent of the aesthetic loss which would be incurred if these animals were to decline.

Finally, something should be said for maintaining nature's balance. Much of the area is covered with black spruce bogs and tundra which are of poor quality for renewable resource development. The animals which have evolved in this environment are very productive and their protection may therefore represent the most efficient use of ^{much of} the land—economically, socially, and ecologically.

Table 8. Estimation of the Direct Impacts of Various Activities on Wildlife Populations

+ 5 (most beneficial) -5 (most adverse)	Fire Control	Roads	Timber Harvesting	Mining	Large-scale Farming	Recreation (ORV's, etc.)	Oil Wells	Pipelines	Water Pollution	River Dams
Moose	-4	-1	-2	-3	-3	-2	-1	-1	-1	-4
Dall sheep	0	-4	0	-4	0	-2	-1	-2	-2	-1
Caribou	+1	-4	-2	-1	-2	-4	-1	-3	-2	-1
Brown bear	0	-4	0	-3	-4	-2	-2	-1	-1	-3
Wolverine	-1	-3	0	-2	-4	-2	-2	-2	-1	-3
Wolf	-2	-3	+1	-2	-5	-3	-2	0	-1	-3
Ermine	-1	-1	-1	-1	-2	-1	-1	0	-2	-4
Land otter	-1	-2	-3	-1	-2	-3	-1	0	-3	-5
Muskrat	-3	-2	-2	-1	-3	-1	-1	0	-3	-5
Mink	-1	-1	-1	-1	-2	-1	0	0	-3	-5
Marten	+2	-1	-1	-1	-4	-1	0	-1	0	-3
Lynx	-1	-1	-2	-2	-3	-2	0	-1	-1	-3
Red fox	-2	-1	0	0	0	0	0	0	-1	-3
Coyote	-2	0	0	0	0	0	0	0	-1	-2
Beaver	-1	-1	-2	-2	-2	-1	-1	-1	-3	-5
Snowshoe hare	-1	0	+1	0	-1	0	0	0	-1	-2
Waterfowl	-4	-2	-1	-2	-3	-2	-1	-1	-4	-5
Sharp-tailed grouse	-5	0	+2	-1	-1	-1	-1	-1	-1	-3
Ruffed grouse	+1	0	+1	-1	-3	-1	-1	-1	-1	-2
Spruce grouse	+4	0	+1	-1	-4	-1	-1	-1	-1	-2
Ptarmigan	-2	0	+1	-1	-4	-1	-1	0	0	-2
Peregrine falcon	-1	-4	-3	-5	-5	-4	-2	-2	-3	-5
Anadromous fish	0	-2	-3	-3	-3	-2	-1	-1	-4	-4
Resident fish	0	-2	-3	-3	-3	-2	-1	-1	-4	-4

Table 7. Estimated Dollar Value of the Annual Subsistence Harvest

SPECIES	Estimated Average Annual Harvest	Average Utilization Weight(c)	Total Pounds Harvested	Approximate Replacement Value of Meat or Pelts \$\$	Total Annual Value	Projected Decline in Harvest Following Large Scale Development %	Projected Annual Economic Loss \$\$
Big Game(b)				Meat(a)			
Moose	500	500	250,000	1.75	437,500	50	218,750
Caribou	1,500	100	150,000	1.75	262,500	70	183,750
Black Bear	120	150	18,000	1.75	31,500	10	3,150
Dall Sheep	60	60	3,600	1.75	6,300	10	630
Furbearers(d)(e)				Pelt(b)			
Muskkrat	12,000	2	24,000	1.75	102,000	20	20,400
Beaver	300	20	6,000	1.75	20,100	20	4,020
Land Otter	4			n.a.	320	10	32
Lynx	700(f)			n.a.	175,000	20	35,000
Fox	300			n.a.	30,000	10	3,000
Marten	700			n.a.	280,000	30	8,400
Mink	190			n.a.	5,700	30	1,710
Ermine	300			n.a.	1,500	30	450
Snowshoe Hare	10,000(f)	3	30,000	1.75	52,500	0	0
Wolverine	130			n.a.	19,500	50	9,750
Wolf	75			n.a.	15,000	60	9,000
Waterfowl(c)							
Ducks	11,000	1.3	3,300	1.75	5,775	50	2,887
Geese	3,000	3.5	10,500	1.75	18,375	50	9,188
Plumigeau	6,000	1.0	6,000	1.75	10,500	20	2,100
Spruce Grouse	3,300	1.0	3,300	1.75	5,775	20	1,155
Fish(e)							
Burbot	150	17	1,050	1.75	184	10	18
Lake Trout	150	5	750	1.75	131	10	13
Grayling	22,000	1	22,000	1.75	7,700	20	1,540
Pike	16,000	10	160,000	1.75	56,000	20	11,200
King Salmon	5,000(f)	15	75,000	3.00	150,000	90	135,000
Chum Salmon	20,000(f)	4.3	86,000	1.75	150,500	70	105,350
Sockeye	4,000	1	4,000	1.75	7,000	0	0
Sheefish	7,000	9	63,000	1.75	11,025	10	1,100
Whitefish	53,000	1.5	79,500	1.75	27,825	20	5,565

(a) 1977 prices of meat, based on \$1.50/pound of wholesale red meat in Fairbanks and \$.25/pound to ship to Ft. Yukon.

(b) Price and harvest data from ADF&G, Compilation of Wildlife, Vol. I (Anchorage:1976).

(c) USDI, Yukon Flats (Washington:1974), p. 97, Replacement Value Data.

(d) Best estimates derived from ADF&G unpublished furbearer data.

(e) Both harvest and total value varies with the market price on pelts.

(f) Harvest varies widely due to fluctuating wildlife populations.

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